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Aqueous N-Doped TiO2 Catalysts for Visible Light Photocatalytic Applications

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Votre résumé :

In this work, TiO_2 prepared with an aqueous sol-gel synthesis by peptization process is doped with nitrogen precursor to extend its activity towards the visible region. Three N-precursors are used: urea, ethylenediamine and triethylamine. Different molar N/Ti ratios are tested and the synthesis is adapted for each dopant. For urea- and trimethylamine-doped samples, anatase-brookite TiO_2 nanoparticles of 6–8 nm are formed, with a specific surface area between 200 and 275 $m^2 g^{-1}$. In ethylenediamine-doped samples, the formation of rutile phase is observed, and TiO_2 nanoparticles of 6–8 nm with a specific surface area between 185 and 240 $m^2 g^{-1}$ are obtained. X-ray photoelectron spectroscopy (XPS) and diffuse reflectance measurements show the incorporation of nitrogen in TiO_2 materials through Ti–O–N bonds allowing light absorption in the visible region. Photocatalytic tests on the remediation of water polluted with *p*-nitrophenol show a marked improvement for all doped catalysts under visible light. The optimum doping, taking into account cost, activity and ease of synthesis, is up-scaled to a volume of 5 L and compared to commercial Degussa P25 material. This up-scaled sample shows similar properties compared to the lab-scale sample, i.e., a photoactivity 4 times higher than commercial P25.

Mots clés : aqueous sol-gel process, multiple crystalline phase catalyst, N-doped TiO2, photocatalysis, p-nitrophenol degradation

Conflits d'intérêts : None Declared